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ABSTRACT

This bibliography and paper provide a brief overview of empirical studies that attempt to apply the insights of modern psychology to architecture. Items are discussed under headings of scientific research, methodology, perceptual studies, the use of space, interpersonal distance, personality development, learning, decision-related research, and problem-solving. (Author/MLF)

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PEOPLE AND BUILDINGS – A Brief Overview Of Research

David Canter, Ph.D.
Lecturer in Environmental Psychology
Department of Architecture and Building Science
University of Strathclyde, Glasgow

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PEOPLE AND BUILDINGS - A BRIEF OVERVIEW OF RESEARCH*

by

David Canter, Ph.D.
Lecturer in Environmental Psychology
Department of Architecture
and Building Science
University of Strathclyde, Glasgow

1. Growth of Interest in People and Buildings

In the past ten years social, and to a lesser extent intellectual pressures have forced a number of psychologists to turn their attention towards the built environment. The same pressures have also drawn many non-psychologists into environmental psychology research. The result has been a great increase in publication in this area. There now exist at least a dozen collections of readings in this area and three or four new journals. Environmental research conferences proliferate, the numbers growing steadily. Recent bibliographies of the field have indicated that there might be as many as a thousand documents related in one way or another to people and their surroundings. A review of all this work is not attempted here. Instead a brief overview is attempted in the hope that it will give some idea of the contribution being made.

Before dealing with research in detail it is of value to examine the pressures for growth in the field as this will help to explain some of its strengths and weaknesses. The interesting point about these pressures is that they are not usually the

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direct causes of research but rather reasons why it is felt that such research should be carried out. Some may even suggest that they are simply research workers' rationalisations.

Probably the major pressure comes from the change in the socio-political climate which has made people feel that they should be part of, or at least considered in, decision making processes which affect them; decisions about the built environment being some of the most potent. This feeling has been fed by the growing gap which now separates the designer from the user. This is a direct product of the growing complexity of society and of the increased specialisation necessary to deal with modern technology. When it is realised that many buildings in present day cities are designed, built, financed, owned, managed and inhabited by totally different people and organisations it is not surprising that there should be a gap between the two ends of this chain. Some are looking to psychology to narrow it.

Another pressure comes from changes in the nature of architecture. The technology is now available to produce buildings of almost any shape or form. The architect is therefore thrown upon his own resources in a way never known before. This, together with the demise of the Beaux Arte tradition and the attitude that architecture is primarily an abstract art, has meant that architects are searching in many new places for their inspiration. They are trying to reduce the possibilities in order to enable them to make a decision. The insights of modern psychology look as if they may furnish a tempting way out of these complexities.

One further development which arises from these two is the increase in the mass production of buildings and with this the use of computers. There has also been a move away from the specification of what contractors are to produce when they build towards the indication of the performance expected of the finished product. All these trends require a much more detailed knowledge and understanding of the way people use and understand their built environment.

From psychology the main pressure seems to come from an increased sophistication and maturity that has enabled psychologists to study problems formerly taboo.

2. Types of Study

The studies which have been carried out in architectural psychology fall into two major categories. There is one group, by far the largest, which is best described as consisting of loose theoretical discussions of the nature of the relationships between man and the places he inhabits. This group will not be dealt with in the present review. The second group consists of studies empirical in nature, many of them having little theoretical basis. The empirical studies lie along a dimension running from the extremely academic at one end to the completely pragmatic at the other. Within this dimension three groupings can be discerned; the first being similar to most academic scientific research, the second carrying out studies in order to provide information upon which design decisions can be made and the third trying to resolve existing problems.

Of course all research in the field is aimed at contributing to decisions about people and buildings. This contribution, however, is different at different stages in the design process. Scientific research contributes mainly at the level of conceptualisation and problem oriented research at the level of specification. Decision oriented research often contributes at both these levels.

3. Scientific Research

Because it draws its inspiration, if not its theories, from conventional psychological research, academic architectural psychology may be usefully considered under conventional psychological headings.

3.1 Methodology

Not surprisingly in such a new area of science there has been great concern with the development and innovation of methods. These have covered both methods of presenting the stimuli and methods of recording and analysing them. There have also been developments in experimental design, particularly in the area of field experiments.

3.1.1

The greatest development in the area of stimulus presentation has been the use of factorially designed stimuli. In other words, elements of the stimuli are varied in a controlled manner, the

main development being in the type and scale of the stimuli which are manipulated. Winkle et al. (1968) have used drawings of roads in which hoardings, or overhead wires were systematically removed. Sanoff (1969) and Van der Ryn and Boie (1963) have presented photographs of houses in which the overall configuration has been modified. Canter and Wools (1970) have used photographs and drawings of room interiors in which such variables as ceiling angle, window size and window arrangement have been manipulated. Hill (1970) used a variety of views from a window in combination with differing rooms of the house from which the view was seen. The success of all these studies in showing measurable and meaningful effects suggests that this type of stimulus manipulation can be a productive one.

One of the central problems in presenting stimuli, especially if factorial manipulations like those above are to be used, has been the great expense and difficulty of using real buildings. There have therefore been a number of studies which have explored the possibilities of using various forms of simulation. All these studies have attempted to validate the simulation against some criterion. However, one problem which has not really been resolved is that of deciding what the most suitable criterion is. Should it be an actual building in use? If so, in use for how long? Should the judgements be made by casual visitors or by those who have been in the building for some time? Is there any psychological difference between judging a building you know and judging a building represented in some form? The answers to many of these questions may be resolved empirically but it is possible

that judgements of a simulation might well be more valid in some contexts than judgements of the actual building.

The research which has been carried out all indicates that, with the present methods of measuring response, simulations are closely related to each other and to actual buildings. The validity of slides and television has been examined by Bonsteel (1969), models by Lau (1970). Colour and black and white photographs of scale models have been compared with line drawings taken from the photographs by presenting subjects with all three forms as slides by Wools (1970). Nagase (1971) has had subjects judge colour and black and white photographs of buildings taken from varying distances and like all the above investigators has found close similarity between the judgements. One of the few studies that has compared slides directly with actual buildings has been that by Peterson et al. (1969) and he also found close correspondence. With hindsight it can be seen that it is not surprising that simulations should give rise to judgements that correspond from one simulation to another and that relate to the object simulated, for if this were not the case then simulations would never be recognised as representative of the objects they simulate. The problem for future study must therefore be to find those areas in which real differences can be revealed. The most likely areas being movement speeds, waiting times and other aspects of observable behaviour which takes place <u>within</u> buildings and by their very nature can only exist in some abstracted form with representations.

3.1.2

Developments in the recording and analysing of response has included both the development of new pieces of apparatus such as the hodometer for measuring movement (Bechtel, 1967) and the use of meshes of varying density for use by subjects to indicate their privacy requirements, and sophisticated pencil and paper recording devices such as behavioural mapping (Ittelson et al. 1970a). An increase in the use of unobtrusive measures of the type described by Webb et al. (1966) has also taken place. In fact one of the most interesting examples cited by Webb et al., the counting of nose prints on the display case window to measure interest in museum exhibits, may be considered an early piece of architectural psychology. It should be noted that the designers involved in this research have brought to bear their design skills on the preparation and presentation of the traditional psychological diagrams such as graphs and histograms often showing how informative such means of presentation can be.

From the traditional psychological areas of scale construction standard techniques have been used to create attitudinal measuring instruments. These have included scales for the measurement of attitudes towards open offices (Manning 1965) and towards privacy (Reading et al. 1967). Semantic differential scales have been developed specifically for the architectural context by Kasmar (1970), Hershberger (1969) and Collins (1969). Canter (1971) has developed a similar technique to create a series of attitude scales, dealing with satisfaction with aspects of the building such

as heating, lighting and acoustics. Unpublished work by Canter has also shown that these scales can be translated into Japanese and Czech without losing any of their reliability.

A number of standard techniques have also been used in a novel way. Magnitude estimation, for instance, has been used by Inui (1971) to measure spaciousness and by Hill (1970) to measure the ability to see through meshes. Using furniture as the "constructs" and room shapes as the "elements" Canter and Tagg (1972) have shown that the repertory grid has great potential with non verbal stimuli.

3.1.3

Because the subject matter of architectural psychology is essentially outside of the laboratory, field experiments would seem to be one of the better ways of carrying out scientific research. The few which have been done have been very fruitful. Ittelson et al. (1970b) have shown the effects of redesigning hospital day rooms and Canter (1968a) has shown the effects of office size. The work of Sommer (1969) in such places as libraries and cafeterias has shown the subleties which are possible.

It is clear from the above that architectural psychology research can now draw upon a wide range of valuable techniques and furthermore that it is possible for studies in this field to demonstrate the great potential of many psychological techniques not otherwise apparent.

3.2 Perceptual Studies

As might be expected from the potent visual stimuli emanating from many works of architecture it is in the area of perceptual studies that the greatest amount of work has been carried out but surprisingly there have been few experimental studies of aesthetics in architecture. One of the few studies is that of Edge (1957) who showed that Le Corbusier's modular was not essential for giving rise to preferences for buildings. It was far more important that they should be recognised as buildings designed by Le Corbusier. With a different approach Mintz (1956) has shown that an aesthetically pleasing room has an effect on judgements of faces that is different from the effects of an ugly room. Wools and Canter (1970) showed an effect could also be produced on judgements on drawings of rooms. Kasmar et al. (1968) was not able to show that any effect on the judgement of psychiatrists was caused by the rooms in which the psychiatric interview took place.

With the exception of the work of Ida (1969) who studied the way in which people visually segmented a walk through the city, the great majority of perceptual studies have attempted to relate various physical forms to attitudes or preferences. However it is interesting to note that following from the earlier studies of the effects of aesthetic surroundings it has proven very difficult to isolate perceptual problems from those that are cognitive in nature. Furthermore this complexity is increased by the fact that architectural stimuli also have implications for the activities that go on within or around them and for the people who work within or use them. Rosenthal (1966) revealed the effect of laboratory tidiness

on judgements of the experimenter and Canter (1968b), and West (1970) have both shown a close correlation between judgements of rooms and judgements of the owners of those rooms. The work of Laumann and House (1970) has extended these findings into the sociological domain.

The fact that the text book distinctions of judgement, perception, cognition and attitude are not readily discernible without the rigorous controls of the laboratory, has given rise to two discernible approaches. Either the dimension along which response is to be measured is assumed and research concentrates on establishing a relationship between that dimension and some physical dimension or the nature of the psychological response is explored and an attempt is made to establish the most important dimensions.

Even in the former case when research attempts to relate specific psychological to specific physical dimensions there is a difficulty in keeping other psychological variables out of the picture. This is demonstrated in what might be considered one of the earliest architectural psychology field studies, the Hawthorne investigations (Roethlishberger and Dickson, 1939). In those studies it was found that variations in lighting affected behaviour but this affect was more to do with the social or industrial implications of the lighting modification than with its physiological or psychophysical effects. If the research allows no possibility for the examination of more general psychological variables then specific relationships can be found. But even in these cases if the psychological variable is not a straightforward judgement but rather an indication of preference or comfort then the physical

stimuli often need to be measured in novel ways in order to show relationships to the psychological measurements. For instance, Keighley (1966) in offices and Griffiths and Langdon (1968) dealing with traffic noise both showed that simple measures of noise level were not sufficient to predict dissatisfaction. Some measure which represented the amount of fluctuation in the noise level was also necessary.

Perhaps heating is the one area where simple comfort rating can be shown to have reasonably straightforward relationships with conventional physical measurements as has been shown since the early studies of Bedford (1936). Although Wyon (1969) and Griffiths (1970) have shown that the complexities predicted from the arousal hypothesis can be demonstrated empirically.

Studies of the underlying dimensions of verbal responses to architectural stimuli have proved their worth in post-graduate theses (Vielhauer 1965, Canter 1969, Hershberger 1970, Collins 1969, Wools 1971 and Black 1965). These factor analytic studies which stem from Osgood et al. (1957) have shown consistent differences from his dimensions. These differences have been corroborated in Swedish by Acking (1971) and in Japanese by Ichikawa (1969). Rather than finding evaluation, potency and activity as Osgood did, these studies have indicated that the largest dimension is a pleasantness/aesthetic one, the other dimensions all still maintaining a strongly evaluative flavour.

There have been relatively few attempts to relate these dimensions to variations in actual environments, for as we shall see

later studies of actual environments have been carried out within a much more pragmatic context usually as case studies. Those which have been done (Collins 1969, Canter and Wools 1970, Canter and Thorne 1972, and Van der Ryn and Boie 1963) have shown consistent and meaningful effects but the work needs to be extended considerably before it can have any major theoretical or practical implications.

There has also been some relevant work in 'organisational psychology'. Studies such as those by Hertzberg (1962) and Smith (1962) have shown that the physical conditions of work are unrelated to other aspects of job satisfaction. When trying to examine this more directly Canter (B.P.R.U. 1972) found that the physical environment accounted for little more than the error variance in teachers' preference for schools whereas the headmaster and pupils accounted for about eighty per cent. These proportions were corroberated when teachers were asked to make judgements of the salary increases necessary in order to work in various conditions. Some architects have suggested that the little importance placed on environmental conditions is more an indictment of present day design than an indication of mechanisms of behaviour.

One further area of perceptual studies in which there has been considerable interest has been in the study of images or schemata. Following Bartlett (1932), Lee (1968) has shown that there is a definite set of environmental variables associated with the concept of the neighbourhood. He has developed this to show that it can help explain such phenomena as errors in judgements of distances in a city and the differential effects of walking to school as

opposed to travelling by bus. Lynch (1960) and Appleyard (1970) have studied similar problems but taking the more descriptive approach of planners in concentrating mainly upon those visual aspects of a city which contribute to the clarity of its image. In Japan, Suzuki (1970) has explored the development of images in school children and produced results which support the general approach taken in the west. The relationship between the different areas of psychophysical and social psychology is shown by a recent unpublished study by Canter. He found that psychophysical judgements of distances across cities related closely to familiarity.

The most important finding which comes from these studies is that it is in the overlap between traditional areas of psychology that the most interesting results can be found. It is perhaps in the area of architecture that this overlap can be most readily studied.

3.3 The Use of Space

As in the area of perception, it would seem that studies of man's use of space would provide considerable information directly of value to design, but studies to date seem actually to contribute more to psychology.

3.3.1 (Location in Space)

Casual observation shows that people locate themselves in space in quite specific ways. Stilitz (1970) has added substance to this observation with his studies of London tube stations and

theatre foyers. Kamino (1968) has found remarkably similar results in railway stations in Osaka. The fact that such neat and replicable findings can be demonstrated in this field have led to many undergraduate studies of location or behaviour but unfortunately this work is rarely co-ordinated to the degree that generalisations can be made from it.

Old people have proved of particular interest from the point of view of their spatial behaviour. Besides the work of Lipman (1968) in Britain and Araki (1966) in Japan there have been a number of American studies recently published as a set of readings edited by Pastalan and Carson (1970).

Surprisingly few studies have been carried out of the places where groups locate themselves in buildings although this has clear implications for social interaction and communication. In the Building Performance Research Unit appraisal of a school building (B.P.R.U., 1972) it was found that the design of the school lent itself very readily to the formation of small groups for coffee with a consequent reduction in informal interaction between teachers. However there have been a number of studies examining the relationship between building layout and patterns of interaction, one of the earliest studies being that of Festinger et al. (1950). Since that study the results have been repeated both in a number of housing schemes and hospital wards by Kurihara (1969), in offices by Gullahorn (1952) and Wells (1965), and in students' halls of residence by Warr (1964).

3.3.2 (Interpersonal Distance)

Other research workers have concerned themselves with the distances people maintain between themselves. Sommer (1969) has found as Hall (1966) had suggested that consistent interpersonal distances exist in a variety of situations. Little (1965) and De Long (1970) have shown that these distances can have quite specific meanings or implications so that studies which initially started out as quite descriptive are now beginning to contribute to a theoretical understanding of interpersonal distance. The greatest contribution to this theory has come from Altman (1971) who has shown the way in which the use of space can have symbolic implications which facilitate the social interaction the participants expect or have experienced.

Some attempt has been made to relate interpersonal distance to animal behaviour but it seems that concepts drawn from studies of animals need to be greatly modified when used with people. As Calhoun (1962) and Klopfer (1969) have both pointed out this is particularly true to "territoriality". Attempts have also been made to relate these ideas to the ecological psychology of Barker (1968), e.g. Willems (1967), but so far the scale of Barker's behavioural settings has proved too gross to reveal any effects than can be directly related to specific aspects of the physical environment.

3.4 Areas of Little Research

Besides the areas that have been discussed there have been few studies drawing upon other conventional psychological approaches. There thus remain many areas in which the existing psychological literature gives rise to many hypotheses and which have great potential. Three areas in particular lend themselves to development in the area of environmental psychology; personality, development and learning.

3.4.1 (Personality)

There have been a few attempts to isolate those personality dimensions which will help to explain the great individual differences which are apparent in people's responses to the physical environment. So far there has been little consistency in the results produced. Griffiths (1970), Hill (1970) and Wools (1971) all used Eysenck's Personality Inventory but the relationships which they found conflicted with one another. Winkle et al. (1968) developed their own scale for measuring individual differences and attitude towards the roadside environment and did find close correlation with actual judgements of roadside views but it was not possible to relate his measure of individual differences to those found in the psychological literature. A quite different approach has been taken by Canter (1970) who has used various measures of cognitive complexity and found that they do relate to satisfaction with aspects of the physical environment. He found however that the various measures were not closely related to one

another, suggesting that the relationship between cognitive complexity and satisfaction was very specific to the particular aspect of the building to which it referred. A most intriguing line of study was initiated by Mori and Kambe (1965) who showed that preferences for colour of illumination related to the skin complexion of the respondent. It would seem worthwhile trying to find other situations in which specific personal characteristics could be shown to relate to environmental preferences.

3.4.2 (Development)

Nearly all the empirical studies of development of responses to physical surroundings at the architectural scale have been carried out in Japan. The only study in the west appears to be an unpublished one by Firth. He had twelve, fourteen and sixteen-year-old boys give semantic differential-type responses to factorially designed room interiors and found that the results from the analysis of variance showed a progressive increase in the complexity of responses with age.

Kitaura (1969) combined observations of children in experimentally designed rooms with surveys of parents' awareness of their children's spatial requirements and was able to indicate fairly clear developmental stages in the children's dealing with their architectural surroundings. Koseki et al. (1970) carried out a number of observations and surveys of children's play and came to the conclusion that there was a need for a large play object for children below the age of five which was not available at

that time. A number of Japanese investigators have also explored the images which children have about buildings and groups of buildings. Their main concern has been to explore the errors which children make when they draw maps of their neighbourhood areas or plans of their homes or schools (Suzuki 1970, Adachi and Kamino 1969, and Fujimoto and Acki 1968). They all found that certain mistakes were characteristic of different ages and that the development of the mental image could be extrapolated from the results.

3.4.3 (Learning)

There is only one set of studies in the literature which draws directly upon psychological theories of learning (Cohen 1964). Yet as Studer (1969) has argued there is a very strong case for considering the whole man/environment interaction as a learning process. It would seem that movement through spaces, particularly novel spaces has a lot in common with the learning of mazes and that psychological learning theories could usefully be developed by studies of such movement. The study of Ikehara (1969), who watched people moving through a park, Best (1970) who questioned people moving through an English Victorian town hall and Myrick and Marx (1968) who observed children moving through a school building, all found patterns of behaviour that were more complicated than would be predicted from theories of behaviour based upon observations of rats or pigeons.

Possibily a change can be discerned in the type of work which is being carried out at the present time. As more and more psychologists become interested in environmental problems there is an

increasing use of psychological formulations to explain human behaviour in buildings. It is to be hoped that this trend will continue and that the study of personality, development and learning will be extended from psychology into buildings.

4. Decision Related Research

Research oriented specifically towards design decision making problems can contribute at one of three stages during the design process; before detailed design is initiated, whilst various design solutions are being considered or after the building is completed.

4.1 Before Design

The problem most frequently put to psychologists before design is the problem of what people want or need in the particular building in question. This question has been tackled most consistently by the "user requirements" studies carried out at the British Building Research Station. The great difficulty in this type of investigation is getting information on what people want which is independent of what they already have. People's wants and needs fluctuate and change so that no distinct list of environmental needs can be agreed upon. This has thrown some doubt upon the validity of this approach. The further suggestion that this type of study ossifies existing designs and limits the innovation which it is possible for an architect to produce has further made some architects antagonistic towards the results.

4.2 During Design

It seems likely that the best way in which the psychologists can contribute to design whilst various solutions are being considered is to bring his expertise and methodology on to the actual design team. In this context he could use various forms of representation of the proposed solutions and test these out with various subject groups. Beyond this the ideas and findings which are coming out of academic studies and from studies before and after design can only grow in the contribution that they make.

4.3 After Design

The growth in the number of appraisals of buildings has been one of the greatest growth areas in the whole field. Two long term research units were set up in Britain specifically to deal with building appraisal, a major symposium was recently held to discuss work in this field (Archea and Eastman 1970) and a number of privately sponsored and government sponsored appraisal studies have been carried out in Britain, America and Japan. The King Edward Hospital fund has sponsored appraisals of hospital buildings and the Ministry of Housing carried out a number of appraisals of public housing schemes. Offices, schools, halls of residence and almost every other non-commercial building type has been subjected to some form of post-design evaluation. In nearly all cases the technique and measuring instruments have been different, as have the aims and expertise of the people carrying out the research. Usually the study has been a case study that brings to light the unique qualities of the building being studied but does not

enable any generalisations relevant to other buildings to be made. The situation is probably improving as measuring techniques are being standardised and there is a growing consensus about the crucial problems to be tackled but to date the main benefits of these appraisals seems to have been in broadening the experience of the people carrying out the appraisal rather than in contributing to architectural understanding.

5. Problem Solving

The great majority of studies which have dealt with specific design problems never got published. These are carried out within the context of a design organisation that has a commercial involvement in the results which are produced. However there are two problems to which attention has been given and for which a number of reports are available. One is the study of open plan offices with particular reference to office landscaping (e.g. Bach, 1965). A number of before and after examinations of the effect of providing office landscaping have been produced and although the systematic controls in these studies have been necessarily poor because of the practical difficulties the general findings have been in favour of this approach to office design. The other area has been the study of schools without windows (Demos and Zuwaylif, 1967). This study employed reasonable controls and showed that classrooms without windows are no worse than classrooms with them.

It is interesting that when these real world problems are tackled, and results that have some scientific validity are described to designers, they still would rather trust their own intuition and experience than the findings. It is thus a little paradoxical that it is in the area of problem solving that the strongest tests of psychological approaches are made. If the designer can actually see built examples of the stimuli being studied he needs a lot of convincing to accept that his understanding of those stimuli which has developed over years of professional experience can be added to by the results of studies carried out by people whose expertise is clearly not architectural. It is in this area of problem solving that the theoretical scientific aspects of architectural psychology need to be most carefully worked out in order that they can be seen to give rise to a viable and acceptable technology. It is still unfortunately the case that the strongest extrapolations from psychology into the physical environment are from attitude scale construction and research methodology not from theories.

6. Educating Designers

Psychologists and psychological ideas are being drawn into architecture in one further way. More and more schools of architecture are calling upon psychologists to teach psychology and are drawing upon psychological texts in the teaching of their courses. It is in the presentation of psychological information to architecture students that there are the greatest tests of the value and

validity of the subject matter. It would not be surprising if it were these demands which made individual psychologists reconsider much of what they had accepted as valuable and cause them to re-examine the subject matter of their profession in an attempt to orient it more towards real world decision making.

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